PATENT ABSTRACTS OF JAPAN

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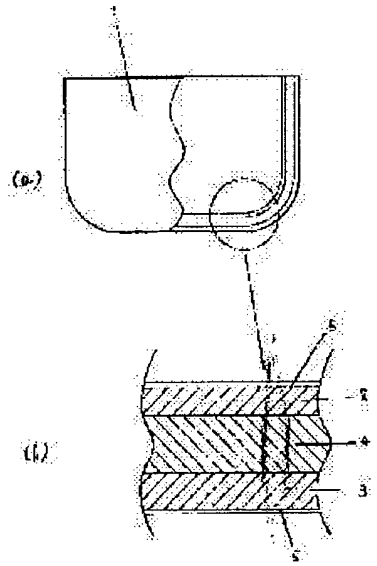
(54) **COOKING POT**

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a cooking pot of light weight having corrosion resistance to which electromagnetic induction heating can be applied.
SOLUTION: As material for composing a cooking pot 1, composite material of a three layer structure or more using titanium or titanium alloy on at least one surface (2 or 3) or both surfaces of heat conductive metal is used, so light weight and improved corrosion resistance are achieved. By using titanium alloy to which electromagnetic induction heating can be applied on an outer surface of the pot, this can be applied to an electromagnetic induction heating type cooker.



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TITLE: COOKING POT

PUBN-DATE: October 5, 1999

INVENTOR-INFORMATION:

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APPL-NO: JP10073835

APPL-DATE: March 23, 1998

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ABSTRACT:

PROBLEM TO BE SOLVED: To provide a cooking pot of light weight having corrosion resistance to which electromagnetic induction heating can be applied.

SOLUTION: As material for composing a cooking pot 1, composite material of a three layer structure or more using titanium or titanium alloy on at least one surface (2 or 3) or both surfaces of heat conductive metal is used, so light weight and improved corrosion resistance are achieved. By using titanium alloy to which electromagnetic induction heating can be applied on an outer surface of the pot, this can be applied to an electromagnetic induction heating type cooker.

DERWENT-ACC-NO: 1999-613909

DERWENT-WEEK: 199953

TITLE: Multilayered structure of stewpot for electromagnetic induction heating type cooking appliances - has composite material which consists of titanium or titanium alloy formed on upper and lower surfaces of good conductive metal such as copper or aluminum respectively

PATENT-ASSIGNEE: MATSUSHITA DENKI SANGYO KK[MATU]

PRIORITY-DATA: 1998JP-0073835 (March 23, 1998)

PATENT-FAMILY:

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JP 11267030 A	October 5, 1999	N/A	006	A47J 036/02

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
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ABSTRACTED-PUB-NO: JP 11267030A

BASIC-ABSTRACT:

NOVELTY - The composite material formed on the upper and lower surfaces (2,3) consists of titanium or titanium alloy. Good heat conducting metals such as aluminum or copper is molded and provided in between the upper and lower surfaces.

USE - In stewpot for electromagnetic induction heating type cooking appliances used for business, domestic use.

ADVANTAGE - Sufficient heat generation by electromagnetic induction is obtained, and sufficient versatility is offered. DESCRIPTION OF DRAWING(S) - The figure shows profile sectional view of stewpot for cooking. (2,3) Upper and lower surfaces.

CHOSEN-DRAWING: Dwg.1/4

TITLE-TERMS: MULTILAYER STRUCTURE ELECTROMAGNET INDUCTION HEAT TYPE COOK APPLIANCE COMPOSITE MATERIAL CONSIST TITANIUM TITANIUM ALLOY FORMING UPPER LOWER SURFACE CONDUCTING METAL COPPER RESPECTIVE

DERWENT-CLASS: P28 X25 X27

EPI-CODES: X25-B02A2; X27-C06;

SECONDARY-ACC-NO:
Non-CPI Secondary Accession Numbers: N1999-452654

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] A pan for cooking in which both or either fabricates composite material which has a configuration of three or more layers equipped with a transcalent metal which consists of titanium or a titanium alloy and changes from a monolayer or a double layer to the interior, and changes among metallic materials which constitute inside-and-outside both the surfaces.
[Claim 2] A pan for cooking in which one side fabricates composite material with a configuration of three or more layers equipped with a transcalent metal which titanium or a titanium alloy, and another side consist of stainless steel, and changes from a monolayer or a double layer to these interior, and changes among metallic materials which constitute inside-and-outside both the surfaces.
[Claim 3] A metallic material which constitutes external surface is the pan for cooking according to claim 1 or 2 characterized by consisting of a titanium alloy which has specific resistance of 80x10 to 6 or more ohm-cm.
[Claim 4] A pan for cooking given in any 1 term of claims 1-3 characterized by carrying out the clothing of titanium and the alloy titanium surface with an oxide film of titanium.
[Claim 5] A pan for cooking given in any 1 term of claims 1-3 which come to have a processing [in which it does not adhere] layer in an inside at least.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the pan for cooking widely used from business use to home use.
[0002]
[Description of the Prior Art] Conventionally, the material which made the bilayer material which consists of aluminum, stainless steel, or aluminum/stainless steel, the three-layer material which consists of stainless steel / aluminum / stainless steel, or the aluminum layer of this three-layer material the structure which combined pure aluminium and alloy aluminum, and made it multilayer structure further as the quality of the material of the pan for cooking of multilayer structure has been used.
[0003] Moreover, although the induction heating cooker which makes electromagnetic induction an energy source instead of a gas range is spreading in recent years, since it is usable also to this induction heating cooker, some pans for cooking have some which used as ferrite system stainless steel the material which constitutes the outermost side, and were considered as the configuration which can generate heat by electromagnetic induction.
[0004]
[Problem(s) to be Solved by the Invention] However, it has the defect that the pan for cooking which consists of aluminum is light, thermal conductivity is low although thermal conductivity is high, it is easy to corrode and there is a defect that it is weak also in reinforcement, corrosion resistance and reinforcement are high and there is an advantage that heat retaining property is also good, on the other hand in being stainless steel, cooking takes time amount upwards and the pan itself becomes heavy.
[0005] Then, although the pan for cooking using the clad plate which consists of aluminum and stainless steel uses each advantage and the defect is mutually compensated with it, since there is misgiving that concentration caused an Alzheimer disease in the brain of aluminum in recent years, the part which touches a cooking object is in the orientation for many people to dislike that it is aluminum, with the rise of a health intention [people]. However, since heat conduction is good, and is a cheap material and aluminum has some which are hard to replace with others as mentioned above, the material which made the three-layer material which consists of stainless steel / aluminum / stainless steel, or the aluminum layer of this three-layer material the structure which combined pure aluminium and alloy aluminum, and made it multilayer structure further came to be used. Thus, although there were feeling of purity and a high-class feeling since [to require], as for the pan used as multilayer structure, the inside-and-outside side was covered by stainless steel, another side and thickness increased, weight became heavy, and a result to which user-friendliness gets worse was brought.
[0006] This invention is accomplished in view of such a condition, and while thermal conductivity is good, has high corrosion resistance and reinforcement and has good heat retaining property, lightweight-ization is realized, and moreover, people's health intention is satisfied and it aims at moreover offering the user-friendly pan for cooking which can be equivalent also to an induction heating cooker.
[0007]
[Means for Solving the Problem] In order to solve the above technical problem, a pan for cooking of this invention uses for the outermost side a titanium alloy which has specific resistance 80x10-6ohm and more than ferrite system stainless steel or cm, when a base material is equivalent to an induction heating cooker using composite material which consists of a transcalent metal, titanium, a titanium alloy, or these and stainless steel. furthermore, a thing for which the clothing of titanium and the alloy titanium surface is carried out with an oxide film of titanium, or a fluorine coat etc. is processed in order to raise user-friendliness -- non-adhesiveness -- being generated -- cheating -- in addition -- and it made it possible to improve corrosion resistance.
[0008] In addition, this invention shall contain pans similar to this, such as a pan for being used for a pan which cooks a cooking object by direct fire, a pan used with an induction heating cooker, and an electric rice-cooker, and performing cooking rice, with the target pan for cooking.
[0009]
[Embodiment of the Invention] The metallic material with which the pan for cooking according to claim 1 constitutes inside-and-outside both the surfaces consists of titanium or a titanium alloy. While fabricating the composite material which has the configuration of three or more layers equipped with transcalent metals, such as aluminum of a monolayer or a double layer, and copper, to the interior, growing into it and heat's getting across to a non-cooking object efficiently by the internal transcalent metal at the time of cooking There is high corrosion resistance, especially the titanium alloy had high intensity, and since inside-and-outside both the surfaces are equipped with titanium or a titanium alloy, moreover, since heat conduction of titanium is

low, a heat insulation effect is high, and since titanium is a kind of a light metal, it has realized lightweight further. Moreover, what is necessary is for it to be possible, and to also make only for one side to consider as titanium or a titanium alloy among the metallic materials which constitute inside-and-outside both the surfaces of the pan for cooking into 3 layer structures, such as titanium (alloy) / aluminum / copper, and titanium (alloy) / copper / steel plate, and just to specifically consider it as the configuration which has a transcalent metal inside.

[0010] The inside of the metallic material with which the pan for cooking according to claim 2 constitutes inside-and-outside both the surfaces, It is that of which one side fabricates composite material with the configuration of three or more layers equipped with the transcalent metal which titanium or a titanium alloy, and another side consist of stainless steel, and changes from a monolayer or a double layer to these interior, and consists. While titanium or a titanium alloy, the ferrite system stainless steel that is magnetic material about transcalent metals, such as aluminum and copper, and external surface in the interior, then electromagnetic-induction heating are also possible and it is usable also to an induction heating cooker, a pan inside specifically Since titanium or a titanium alloy, and stainless steel are exposed to both the surfaces of a pan, it becomes a corrosion resistance high pan for cooking. Moreover, when it is not necessary to correspond to an induction heating cooker, it is also possible for a stainless steel type not to be limited, and to use an inside as stainless steel and it to use external surface as titanium or a titanium alloy.

[0011] The pan for cooking according to claim 3 is characterized by consisting of the titanium alloy with which the metallic material which constitutes the external surface of claim 1 and the pan for cooking given in two has the specific resistance of 80x10 to 6 or more ohm-cm. Usually, by adding and alloying aluminum etc. to pure titanium to electromagnetic-induction heating being impossible by the pure titanium which is nonmagnetic Sufficient pyrexia by electromagnetic induction comes to be acquired by using the titanium alloy with which the specific resistance value became large and the value became 80x10 to 6 or more ohm-cm. In addition, each specific resistance value of the titanium alloy of a publication among this specification is a value in a room temperature.

[0012] Although the pan for cooking according to claim 4 makes the surface of the titanium used for the pan for cooking according to claim 1 to 3, and a titanium alloy generate an oxide film, this is immersed in the solution of an oxidizing quality, or under an oxidizing atmosphere, it heat-treats and it is obtained. The oxide film of titanium also has the operation to which surface lubricity improves, the mold-release characteristic from metal mold improves upwards at the time of pan molding for cooking, and a cooking object prevents 5-100 micrometers of Lycium chinense with burnt deposits by having the thickness of 30 micrometers or more preferably at the time of cooking.

[0013] The pan for cooking according to claim 5 is a pan for cooking according to claim 1 to 3 which has a processing [in which it does not adhere] layer by the fluorine resin coat in an inside at least. Specifically a polytetrafluoroethylene (PTFE) and polytetrafluoroethylene-perphloro alkyl vinyl ether copolymer (PFA) -- and It is the non-adhesive layer which paints 1-3 layers of fluorine plastic paint containing either of tetrafluoroethylene-hexafluoropropylene (FEP) to a material-list side, and is obtained, and the pan for cooking in which a cooking object cannot get burned easily by this can be offered.

[0014]

[Example] (Example 1) It explains hereafter, using drawing 1 about the 1st example of this invention. Inside, the pan 1 for cooking carries out press forming of the material of a three-tiered structure equipped with pure aluminium 4 with a thickness of 1.5mm to the pure titanium 2 whose inside is the thickness of 0.5mm, the titanium alloys 3 whose external surface is the thickness of 0.8mm, and these interior, and is obtained. Although the titanium alloy with which what has a high specific resistance value is selected, and a presentation consists of Ti-6aluminum-4V was used so that the titanium alloy 3 which constitutes the external surface of the pan 1 for cooking used here could respond also to an electromagnetic-induction heating cooking device, if a specific resistance value is the thing of 80x10 to 6 or more ohm-cm, it can respond to electromagnetic-induction heating, and a titanium alloy as shown in a table 1 as an example is mentioned.

[0015]

[A table 1]

No	固有抵抗値が８０×１０$^{-6}$以上のチタン合金の例	固有抵抗値（Ω・ｃｍ）
1	Ｔｉ－２Ａｌ	８２×１０$^{-6}$
2	Ｔｉ－８Ａｌ－１Ｍｏ－１Ｖ	１９９×１０$^{-6}$
3	Ｔｉ－３Ａｌ－２．５Ｖ	１２６×１０$^{-6}$
4	Ｔｉ－６Ａｌ－４Ｖ	１７１×１０$^{-6}$
5	Ｔｉ－５Ａｌ－５Ｓｎ－２Ｚｒ－２Ｍｏ－Ｓｉ	１７１×１０$^{-6}$
6	Ｔｉ－８Ｍｎ	８２×１０$^{-6}$

Ｔｉ：チタン　Ａｌ：アルミニウム　Ｍｏ：モリブデン
Ｖ：バナジウム　Ｓｎ：スズ　Ｓｉ：シリコン

[0016] Moreover, when there is especially no need for electromagnetic-induction heating, there is no limitation in a specific resistance value. Although pure aluminium with good thermal conductivity was used from **** of heat conduction by this example about internal aluminum, even if it has taken the configuration more than two-layer [which may be alloy aluminum, may use copper etc. instead of aluminum, or consists of combination of pure aluminium and alloy aluminum, and combination of aluminum and copper], it is satisfactory in any way, and, in short, heat conduction should just be using the good metal. Moreover, after press forming, after washing the pan for cooking of this example, it performed heating for 30 minutes at 500-630 degrees C among atmospheric air, and obtained the 50-80-micrometer titanium oxide coat 5 on the titanium surface. Or it is also possible to perform fluorine resin coat processing to the interior of the pan for cooking, and to secure non-adhesiveness instead of generating

a titanic-acid-ized coat.

[0017] (Example 2) It explains hereafter, using drawing 2 about the 2nd example of this invention. The pan 6 for cooking carries out press forming of the material of a three-tiered structure which consisted of SUS430J1L8 which are the pure titanium 7 whose inside is the thickness of 0.5mm, and the thickness of 0.8mm whose external surface is ferrite system stainless steel, and equipped these interior with pure aluminium 9 with a thickness of 1.5mm, and is obtained. In this example, the material used outside was used as ferrite system stainless steel so that it could respond also to an electromagnetic-induction heating cooking device, but when there is especially no need for electromagnetic-induction heating, there is no limitation in a stainless steel type. Moreover, about the internal transcalent metal, heat conduction should just be using the good metal like an example 1. Furthermore, after washing the pan for cooking of this example after press forming, while it performed heating for 30 minutes at 500-600 degrees C among atmospheric air and obtained the 50-80-micrometer titanium oxide coat 10 on the titanium surface, by polishing processing, it was failed to shave the oxide film produced on stainless external surface, it carried out mirror polishing, and took out stainless steel gloss.

[0018] (Example 1 of a comparison) It explains hereafter, using drawing 3 about the 1st example of a comparison. The pan 11 for cooking consists of austenite stainless steel (SUS304) 12 whose inside is the thickness of 0.5mm, and ferrite system stainless steel (SUS430J1L) 13 whose external surface is the thickness of 0.8mm, and the interior carries out press forming of the material of the three-tiered structure which consists of aluminum 14 with a thickness of 1.5mm, and is obtained.

[0019] (Example 2 of a comparison) It explains hereafter, using drawing 4 about the 2nd example of a comparison. The pan 15 for cooking carries out press forming of the material of the two-layer structure which consists of aluminum 16 whose inside is the thickness of 2.0mm, and ferrite system stainless steel (SUS430J1L) 17 whose external surface is the thickness of 0.8mm, and is obtained, and the aluminum surface is carried out alumite processing 18.

[0020] (Evaluation) Above, the total thickness of a material and the thickness of the material which constitutes external surface are unified by each, and since a configuration is also the same, equal evaluation is possible for examples 1 and 2 and the examples 1 and 2 of a comparison. Then, the result of having performed evaluation from some viewpoints about these pans for cooking is shown in a table 2 and a table 3.

[0021]

[A table 2]

	上段：基材構成 内面／内部／外面 下段：板厚構成(mm)	鍋内表面処理
実施例1	純チタン/アルミニウム/チタン合金(表104) 0.5 / 1.5 / 0.8	チタン酸化皮膜
実施例2	純チタン/アルミニウム/SUS430J1L 0.5 / 1.5 / 0.8	チタン酸化皮膜
比較例1	SUS304/アルミニウム/SUS430J1L 0.5 / 1.5 / 0.8	特になし
比較例2	アルミニウム/SUS430J1L 2.0 / 0.8	アルマイト

[0022]

[A table 3]

	重量	耐食性	変形	焦げ付き	保温性	電磁誘導加熱
実施例1	69	○	○	○	○	○
実施例2	88	○	○	○	○	○
比較例1	100	○	○	×	○	○
比較例2	82	△	△	×	△	○

○ 良好 △ やや劣る × 劣る

[0023] In a table 2 and a table 3, weight shows the example 1 of a comparison as the characteristic at the time of being referred to as 100, and it can be said that the small value is lighter though natural, and it is easy to treat. About corrosion resistance, pan deformation, and a burn, the condition after performing the liquid which melted and adjusted "the base of Japanese pot-au-feu" of House to water at a rate of 20 g/l within each pan for continuation boiling 500 hours is shown. Heat retaining property shows the difficulty of cooling down of the cooked object in a pan, and the electromagnetic-induction heating property shows the propriety of electromagnetic-induction heating.

[0024] In examples 1 and 2, weight is light, and in the example 1, about 30% of lightweight-ization is attained [especially / the example 1 of a comparison], and also corrosion resistance is good and does not almost have deformation. Moreover, bad debt can respond also to electromagnetic-induction heating by the non-adhesiveness of a titanium oxide coat in the top where heat retaining property is also good by titanium and the stainless effect which there are and constitute an inside-and-outside side. [few] In addition, since internal aluminum is covered by titanium or stainless steel, it does not have concern that aluminum is eluted in a non-cooking object, either.

[0025] On the other hand, about the example 1 of a comparison, since the inside-and-outside side consists of stainless steel, weight is heavy, and since bad debt is seen in a user-unfriendly top, washing also takes an effort. Moreover, in the example 2 of a

comparison, although weight is comparatively light, since the alumite side is exposed to a pan inside, there is elution to the non-cooking object of aluminum, and also corrosion resistance is a little inferior, and there is also much bad debt and it has brought mist and an inferior result in deformation or heat retaining property further.

[0026]

[Effect of the Invention] As mentioned above, according to invention according to claim 1, the metallic material which constitutes inside-and-outside both the surfaces consists of titanium or a titanium alloy. While heat gets across to a non-cooking object efficiently by the internal transcalent metal at the time of cooking by having fabricated the composite material which has the configuration of three or more layers which equipped the interior with transcalent metals, such as aluminum of a monolayer or a double layer, and copper There is high corrosion resistance, especially the titanium alloy had high intensity, and since inside-and-outside both the surfaces are equipped with titanium or a titanium alloy, moreover, since heat conduction of titanium is low, a heat insulation effect is high, and since titanium is a kind of a light metal, it has realized lightweight further. Moreover, people's health intention is satisfied and the user-friendly pan for cooking which can be equivalent also to an induction heating cooker can be offered.

[0027] Moreover, since titanium or a titanium alloy, and stainless steel are exposed to both the surfaces of a pan while titanium or a titanium alloy, and another side have one side usable also to an induction heating cooker among the metallic materials which constitute inside-and-outside both the surfaces by having consisted of stainless steel and having fabricated composite material with the configuration of three or more layers equipped with the transcalent metal which changes from a monolayer or a double layer to these interior according to invention according to claim 2, it becomes a corrosion resistance high pan for cooking.

[0028] Moreover, according to invention according to claim 3, when the metallic material which constitutes external surface especially formed with the titanium alloy which has the specific resistance of 80x10 to 6 or more ohm-cm, sufficient pyrexia by electromagnetic induction comes to be acquired.

[0029] Moreover, according to invention according to claim 4, by having made the surface of titanium and a titanium alloy generate an oxide film especially, surface lubricity can improve and it can also have the operation whose cooking object the mold-release characteristic from metal mold improves upwards at the time of pan molding for cooking, and prevents Lycium chinense with burnt deposits at the time of cooking.

[0030] Moreover, according to invention according to claim 5, the pan for cooking in which a cooking object cannot get burned easily can be offered by having prepared especially the processing [in which it does not adhere] layer in the inside at least.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The outline cross section of the pan for cooking of the 1st example of this invention
[Drawing 2] The outline cross section of the pan for cooking of the 2nd example of this invention
[Drawing 3] The outline cross section of the pan for cooking of the 1st example of a comparison of this invention
[Drawing 4] The outline cross section of the pan for cooking of the 2nd example of a comparison of this invention
[Description of Notations]
1 Six Pan for cooking of this example
2 Seven Pure titanium layer
3 Titanium-Alloy Layer
4 Nine Aluminum layer
5 Ten Titanium oxide layer
8 Ferrite System Stainless Steel Layer

[Translation done.]

(19)日本国特許庁（ＪＰ）　(12) **公開特許公報**（Ａ）　(11)特許出願公開番号

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Ｈ０５Ｂ	6/12	３１４	Ｈ０５Ｂ	6/12	３１４

審査請求　未請求　請求項の数５　ＯＬ　（全 ６ 頁）

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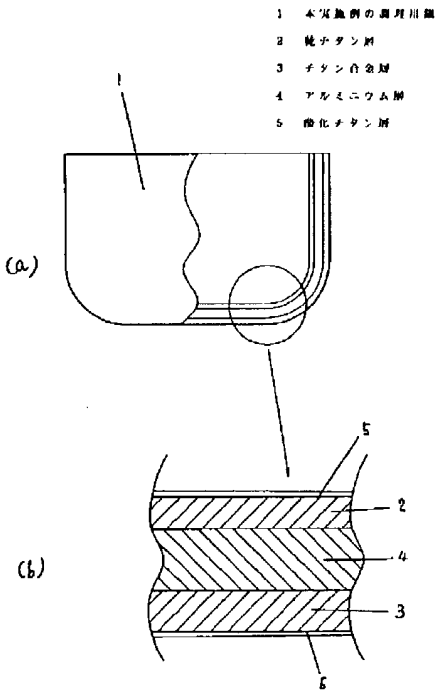
(54)【発明の名称】　調理用鍋

(57)【要約】

【課題】　軽量で、耐食性があり、電磁誘導加熱可能な調理用鍋を提供する。

【解決手段】　調理用鍋１を構成する材料として、熱良導性金属の少なくとも片面（２または３）、または両面にチタンまたは、チタン合金を使用した三層構造以上の複合材料を用いることにより、軽量化、耐食性向上を図るとともに、電磁誘導加熱可能なチタン合金を鍋外面に用いることにより、電磁誘導加熱タイプの調理器にも対応可能とする。



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【特許請求の範囲】

【請求項1】　内外両表面を構成する金属材料のうち、両方または、いずれか一方がチタンまたはチタン合金より構成され、その内部に単層または複層より成る熱良導性金属を備えた三層以上の構成を有する複合材料を成形して成る調理用鍋。

【請求項2】　内外両表面を構成する金属材料のうち、一方がチタンまたはチタン合金、他方がステンレスより構成され、これらの内部に単層または複層より成る熱良導性金属を備えた三層以上の構成を持つ複合材料を成形して成る調理用鍋。

【請求項3】　外面を構成する金属材料は80×10^{-6}Ω・ｃｍ以上の固有抵抗を有するチタン合金から成ることを特徴とした請求項1または2記載の調理用鍋。

【請求項4】　チタン及び合金チタン表面がチタンの酸化皮膜で被服されていることを特徴とする請求項1～3のいずれか1項に記載の調理用鍋。

【請求項5】　少なくとも内面には非粘着処理層を有してなる請求項1～3のいずれか1項に記載の調理用鍋。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、業務用から一般家庭用まで広く使用される調理用鍋に関するものである。

【０００２】

【従来の技術】従来、多層構造の調理用鍋の材質としては、アルミニウムやステンレス、もしくは、アルミニウム／ステンレスよりなる二層材、ステンレス／アルミニウム／ステンレスよりなる三層材、または、この三層材のアルミニウム層を、純アルミニウムと合金アルミニウムを組み合わせた構造などとし、さらに多層構造とした材料等が用いられてきた。

【０００３】また、近年、ガスコンロに代わり電磁誘導をエネルギー源とする電磁調理器が普及してきているが、この電磁調理器にも使用可能とするために、一部の調理用鍋は最外面を構成する材料をフェライト系ステンレスとし、電磁誘導によって発熱できる構成としたものもある。

【０００４】

【発明が解決しようとする課題】しかしながら、アルミニウムから成る調理用鍋は軽く、熱伝導率が高いものの、腐食しやすく、強度的にも弱いという欠点があり、一方、ステンレスの場合には、耐食性や強度が高く、保温性も良好であるという利点はあるが、熱伝導率が低く、調理に時間がかかる上に鍋自体が重くなるという欠点を有している。

【０００５】そこで、アルミニウムとステンレスから成るクラッド材を用いた調理用鍋は、それぞれの利点を利用し、欠点を補い合っているものであるが、近年、アルミニウムの脳内濃化がアルツハイマー病の原因であるとの疑いがあることから、人々の健康志向の高まりとともに、調理物に触れる部位はアルミニウムであることを多くの人々が嫌う傾向にある。しかし、アルミニウムは前述のように熱伝導が良く、安価な材料であることから、他に代え難いものがあるため、ステンレス／アルミニウム／ステンレスよりなる三層材、または、この三層材のアルミニウム層を、純アルミニウムと合金アルミニウムを組み合わせた構造などとし、さらに多層構造とした材料等が用いられるようになった。このように多層構造となった鍋は、内外面がステンレスで覆われているいるため、清潔感や高級感はあるが、他方、厚みが増し重量が重くなり、使い勝手が悪化する結果となった。

【０００６】本発明はこのような状況を鑑みて成されたものであり、熱伝導性が良く、高い耐食性と強度を持ち、良好な保温性を有するとともに、軽量化を実現し、しかも、人々の健康志向を満足させ、その上、電磁調理器にも対応可能な使い勝手のよい調理用鍋を提供することを目的としたものである。

【０００７】

【課題を解決するための手段】以上の課題を解決するために、本発明の調理用鍋は、基材が熱良導性金属とチタンまたは、チタン合金、あるいは、これらとステンレスから成る複合材料を用いたものであり、電磁調理器に対応する場合は、最外面にフェライト系ステンレスまたは、80×10^{-6}Ω・ｃｍ以上の固有抵抗を有するチタン合金を用いたものである。また、さらに使い勝手を向上させるために、チタン及び合金チタン表面をチタンの酸化皮膜で被服するか、フッソコート等を処理することにより、非粘着性を生じせしめ、なおかつ耐食性を向上することを可能とした。

【０００８】なお、本発明が対象とする調理用鍋とは、調理物を直火で調理する鍋、電磁調理器で使用する鍋、また、電気炊飯器に用いられ、炊飯を行うための鍋等、その他これに類する鍋を含むものとする。

【０００９】

【発明の実施の形態】請求項1記載の調理用鍋は、内外両表面を構成する金属材料がチタンまたはチタン合金より構成され、その内部に単層または複層のアルミニウムや銅等の熱良導性金属を備えた、三層以上の構成を有する複合材料を成形して成るものであり、調理時に、熱は内部の熱良導性金属により効率的に非調理物に伝わるとともに、チタンまたはチタン合金を内外両表面に備えているので、高い耐食性が有り、特にチタン合金は高強度を持ち、しかも、チタンは熱伝導が低いため保温効果が高く、さらに、チタンは軽金属の一種であるため、軽量さをも実現している。また、調理用鍋の内外両表面を構成する金属材料の内、一方のみがチタンまたは、チタン合金とすることも可能であり、具体的には、チタン（合金）／アルミニウム／銅やチタン（合金）／銅／鋼板等の三層構造とし、内部に熱良導性金属を有する構成とすればよい。

3

【００１０】請求項２記載の調理用鍋は、内外両表面を構成する金属材料のうち、一方がチタンまたはチタン合金、他方がステンレスより構成され、これらの内部に単層または複層より成る熱良導性金属を備えた三層以上の構成を持つ複合材料を成形して成るものであり、具体的には、鍋内面をチタンまたはチタン合金、内部をアルミニウムや銅等の熱良導性金属、外面を磁性材であるフェライト系ステンレスとすれば、電磁誘導加熱も可能であり、電磁調理器にも使用可能であるとともに、鍋の両表面にはチタンまたはチタン合金及びステンレスが露出しているため、耐食性の高い調理用鍋となる。また、電磁調理器に対応する必要がない場合は、ステンレスの鋼種は限定される必要はなく、また、内面をステンレス、外面をチタンまたはチタン合金とすることも可能である。

【００１１】請求項３記載の調理用鍋は、請求項１及び２記載の調理用鍋の外面を構成する金属材料が$80\times10^{-6}\Omega\cdot cm$以上の固有抵抗を有するチタン合金から成ることを特徴としたものであり、通常は非磁性である純チタンでは電磁誘導加熱が不可能であるのに対し、純チタンにアルミニウムなどを添加して合金化することにより、固有抵抗値が大きくなり、その値が$80\times10^{-6}\Omega\cdot cm$以上となったチタン合金を用いることにより、電磁誘導による十分な発熱が得られるようになる。なお、本明細書中記載のチタン合金の固有抵抗値は、いずれも室温における値である。

【００１２】請求項４記載の調理用鍋は、請求項１～３記載の調理用鍋に用いられるチタン及びチタン合金の表面に酸化皮膜を生成させたものであるが、これは酸化性の溶液に浸漬するか、酸化雰囲気下で加熱処理して得られる。チタンの酸化皮膜は、５～１００μm、好ましく＊は３０μm以上の厚みを有することにより、表面潤滑性が向上し、調理用鍋成型時に金型からの離型性が良化する上に、調理時に調理物が焦げ付くことを防止する作用も合わせ持つ。

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【００１３】請求項５記載の調理用鍋は、少なくとも内面にはフッソ樹脂コートによる非粘着処理層を有する、請求項１～３記載の調理用鍋であり、具体的には、ポリテトラフルオロエチレン（ＰＴＦＥ）、ポリテトラフルオロエチレン－パーフロロアルキルビニルエーテル共重合体（ＰＦＡ）及び、テトラフルオロエチレン－ヘキサフルオロプロピレン（ＦＥＰ）のいずれかを含有するフッソ樹脂塗料を材料表面に１～３層塗装して得られる非粘着層であり、これにより調理物が焦げ付きにくい調理用鍋を提供することができる。

【００１４】

【実施例】（実施例１）以下、本発明の第１の実施例について図１を用いつつ説明する。調理用鍋１は、内面が厚み０．５mmの純チタン２、外面が厚み０．８mmのチタン合金３、これらの内部には厚み１．５mmの純アルミニウム４を備えた、３層構造の材料をプレス成形して得られたものである。ここで使用される、調理用鍋１の外面を構成するチタン合金３は、電磁誘導加熱調理器にも対応可能なように、固有抵抗値が高いものを選定し、組成がＴｉ－６Ａｌ－４Ｖからなるチタン合金を使用したが、固有抵抗値が$80\times10^{-6}\Omega\cdot cm$以上のものなら電磁誘導加熱に対応可能であり、例としては表１に示すようなチタン合金が挙げられる。

【００１５】

【表１】

No	固有抵抗値が80×10^{-6}以上のチタン合金の例	固有抵抗値（Ω・cm）
1	Ｔｉ－２Ａｌ	82×10^{-6}
2	Ｔｉ－８Ａｌ－１Ｍｏ－１Ｖ	199×10^{-6}
3	Ｔｉ－３Ａｌ－２．５Ｖ	126×10^{-6}
4	Ｔｉ－６Ａｌ－４Ｖ	171×10^{-6}
5	Ｔｉ－５Ａｌ－５Ｓｎ－２Ｚｒ－２Ｍｏ－Ｓｉ	171×10^{-6}
6	Ｔｉ－８Ｍｎ	82×10^{-6}

Ｔｉ：チタン　Ａｌ：アルミニウム　Ｍｏ：モリブデン
Ｖ：バナジウム　Ｓｎ：スズ　Ｓｉ：シリコン

【００１６】また、特に電磁誘導加熱の必要性がないときは、固有抵抗値に限定はない。内部のアルミニウムに関しては、本実施例では、熱伝導の見知から、熱伝導性良好な純アルミニウムを用いたが、合金アルミニウムであっても、アルミニウムの代わりに銅等を用いてもよく、あるいは、純アルミニウムと合金アルミニウムの組み合わせや、アルミニウムと銅の組み合わせからなる２層以上の構成をとっていても何ら問題はなく、要するに熱伝導が良好な金属を使用していればよい。また、本実施例の調理用鍋は、プレス成形後、洗浄した後、大気中５００～６３０℃で３０分間加熱を行い、チタン表面に５０～８０μmの酸化チタン皮膜５を得た。あるいは、※チタン酸化皮膜を生成する代わりに、調理用鍋内部にフッソ樹脂コート処理を行い、非粘着性を確保することも可能である。

【００１７】（実施例２）以下、本発明の第２の実施例について図２を用いつつ説明する。調理用鍋６は内面が厚み０．５mmの純チタン７、外面がフェライト系ステンレスである厚み０．８mmのＳＵＳ４３０Ｊ１Ｌ８より成り、これらの内部に厚み１．５mmの純アルミニウム９を備えた、３層構造の材料をプレス成形して得られたものである。本実施例では、電磁誘導加熱調理器にも対応可能なように、外面に用いられる材料はフェライト系ステンレスとしたが、特に電磁誘導加熱の必要性がな

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いときは、ステンレスの鋼種には限定がない。また、内部の熱良導性金属については、実施例１同様、熱伝導が良好な金属を使用していればよい。さらに、本実施例の調理用鍋は、プレス成形後、洗浄した後、大気中５００～６００℃で３０分間加熱を行い、チタン表面に５０～８０μｍの酸化チタン皮膜１０を得るとともに、ステンレスの外面に生じた酸化皮膜は研磨処理にて削り落として、鏡面研磨し、ステンレス光沢を出した。

【００１８】（比較例１）以下、第１の比較例について図３を用いつつ説明する。調理用鍋１１は内面が厚み０．５ｍｍのオーステナイト系ステンレス（ＳＵＳ３０４）１２、外面が厚み０．８ｍｍのフェライト系ステンレス（ＳＵＳ４３０Ｊ１Ｌ）１３で構成され、その内部は厚み１．５ｍｍのアルミニウム１４から成る３層構造の材料をプレス成形して得られたものである。

【００１９】（比較例２）以下、第２の比較例について図４を用いつつ説明する。調理用鍋１５は内面が厚み２．０ｍｍのアルミニウム１６、外面が厚み０．８ｍｍのフェライト系ステンレス（ＳＵＳ４３０Ｊ１Ｌ）１７で構成される、２層構造の材料をプレス成形して得られたものであり、アルミニウム表面はアルマイト処理１８＊

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＊されている。

【００２０】（評価）以上、実施例１，２及び比較例１，２はいずれも材料の総厚みと外面を構成する材料の厚みが統一されており、形状も同一であるため、平等な評価が可能である。そこで、これらの調理用鍋について、いくつかの観点から評価を行った結果を表２、表３に示す。

【００２１】

【表２】

	上段：基材構成 内面／内部／外面 下段：板厚構成（ｍｍ）	鍋内表面処理
実施例1	純チタン/アルミニウム/チタン合金(表104) 0.5 / 1.5 / 0.8	チタン酸化皮膜
実施例2	純チタン/アルミニウム/SUS430J1L 0.5 / 1.5 / 0.8	チタン酸化皮膜
比較例1	SUS304/アルミニウム/SUS430J1L 0.5 / 1.5 / 0.8	特になし
比較例2	アルミニウム/SUS430J1L 2.0 / 0.8	アルマイト

【００２２】

【表３】

	重　量	耐食性	変　形	焦げ付き	保温性	電磁誘導加熱
実施例1	６９	○	○	○	○	○
実施例2	８８	○	○	○	○	○
比較例1	１００	○	○	×	○	○
比較例2	８２	△	△	×	△	○

○ 良好　△ やや劣る　× 劣る

【００２３】表２、表３において、重量は比較例１を１００とした場合の指数で示しており、当然ながら小さい値の方が軽く、扱いやすいと言える。耐食性、鍋変形、焦げ付きについては、（株）ハウスの「おでんの素」を２０ｇ／１の割合で水に溶かして調整した液体を各鍋内で連続煮沸５００時間行った後の状態を示している。保温性は鍋内の被調理物の冷めにくさを示すもので、電磁誘導加熱特性は、電磁誘導加熱の可否を示している。

【００２４】実施例１及び２においては、重量が軽く、特に実施例１では比較例１に比べて約３０％の軽量化が図られているほか、耐食性は良好であり、変形もほとんどない。また、酸化チタン皮膜の非粘着性により、焦げ付きは少なく、また、内外面を構成するチタンやステンレスの効果で保温性も良好な上に、電磁誘導加熱にも対応可能である。このほか、内部のアルミニウムはチタンあるいは、ステンレスで覆われているため、アルミニウムが非調理物に溶出するという懸念もない。

【００２５】一方、比較例１については、内外面がステンレスより構成されているため、重量が重く、使い勝手※が悪い上に、焦げ付きが見られるため、洗浄にも労力を要する。また、比較例２では、重量は比較的軽いものの、アルマイト面が鍋内面に露出しているため、アルミニウムの非調理物への溶出がある他、耐食性がやや劣り、焦げ付きも多く、さらに、変形や保温性においてもやや劣る結果となっている。

【００２６】

【発明の効果】以上のように、請求項１記載の発明によれば、内外両表面を構成する金属材料がチタンまたはチタン合金より構成され、その内部に単層または複層のアルミニウムや銅等の熱良導性金属を備えた三層以上の構成を有する複合材料を成形したことにより、調理時において、熱は内部の熱良導性金属により効率的に非調理物に伝わるとともに、チタンまたはチタン合金を内外両表面に備えているので、高い耐食性が有り、特にチタン合金は高強度を持ち、しかも、チタンは熱伝導が低いため保温効果が高く、さらに、チタンは軽金属の一種であるため、軽量さをも実現している。また、人々の健康志向を満足させ、その上、電磁調理器にも対応可能な使い勝

手のよい調理用鍋を提供できる。

【００２７】また、請求項２記載の発明によれば、内外両表面を構成する金属材料のうち、一方がチタンまたはチタン合金、他方がステンレスより構成され、これらの内部に単層または複層より成る熱良導性金属を備えた三層以上の構成を持つ複合材料を成形したことにより、電磁調理器にも使用可能であるとともに、鍋の両表面にはチタンまたはチタン合金及びステンレスが露出しているため、耐食性の高い調理用鍋となる。

【００２８】また、請求項３記載の発明によれば、特に、外面を構成する金属材料が$80\times10^{-6}\Omega\cdot cm$以上の固有抵抗を有するチタン合金で形成したことにより、電磁誘導による十分な発熱が得られるようになる。

【００２９】また、請求項４記載の発明によれば、特に、チタン及びチタン合金の表面に酸化皮膜を生成させたことにより、表面潤滑性が向上し、調理用鍋成型時に金型からの離型性が良化する上に、調理時に調理物が焦げ付くことを防止する作用も合わせ持つことができる。

【００３０】また、請求項５記載の発明によれば、特に、少なくとも内面に非粘着処理層を設けたことにより、調理物が焦げ付きにくい調理用鍋を提供することができる。

【図面の簡単な説明】

【図１】本発明の第１の実施例の調理用鍋の概要断面図

【図２】本発明の第２の実施例の調理用鍋の概要断面図

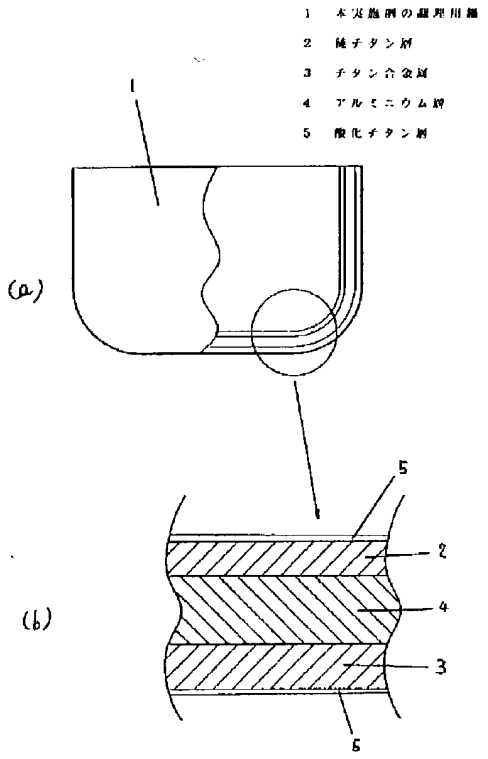
【図３】本発明の第１の比較例の調理用鍋の概要断面図

【図４】本発明の第２の比較例の調理用鍋の概要断面図

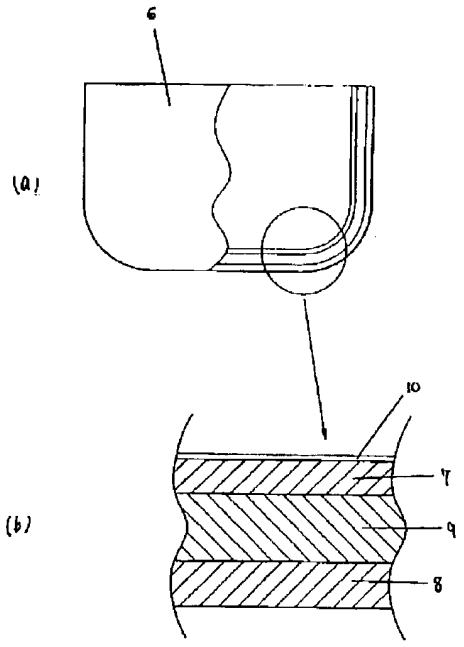
【符号の説明】

１，６　本実施例の調理用鍋
２，７　純チタン層
３　チタン合金層
４，９　アルミニウム層
５，１０　酸化チタン層
８　フェライト系ステンレス層

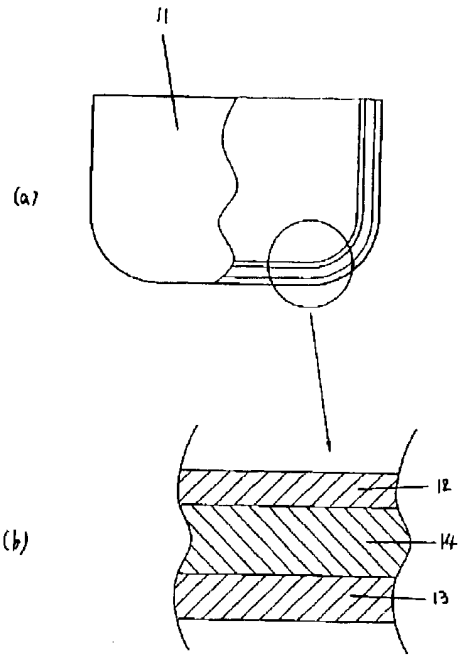
【図１】



【図２】



【図3】



【図4】